

Washington State Energy Strategy Update

Energy Information and Data

[NOTE: This material is still being revised and updated to reflect more recent usage and price data that have just become available]

The energy information and data contained in this document responds to questions from the members of the Energy Strategy Advisory Committee and to questions raised in a report produced in Spring 2001, *Q & A Concerning Impacts of the Current Energy Situation on Washington States Economy* (available at website). The aim of this information is to help improve our understanding of the energy situation in Washington State, particularly in light of events that occurred during 2001 as a result of the West Coast electricity crisis. This information provides guidance to the Washington State Energy Strategy revision process.

The information is presented in a question and answer format. The following questions are considered:

1. What happened to *wholesale* energy prices in Washington?
2. What was the impact of the drought on electricity supply?
3. How have retail natural gas and electricity rates in Washington changed as a result of the west coast energy crisis?
4. How do retail electricity and natural gas rate increases affect Washington's "average" household and commercial business?
5. As a result of the west coast energy crisis, how do energy prices in Washington compare to other states?
6. How does new generation influence the diversity of generation in the state?
7. Where is growth occurring in electricity consumption in the state?
8. How does growth in electricity consumption and expenditures relate to other economic indicators?
9. Where is growth occurring in natural gas consumption in the state? Is there any evidence of increasing consumption for electricity generation?
10. What is the impact of energy consumption in Washington on the production of greenhouse gases?
11. What is the mix of utility types in Washington?
12. What is the level of investment in energy conservation in Washington?
13. What is the electricity flow into and out of the region?

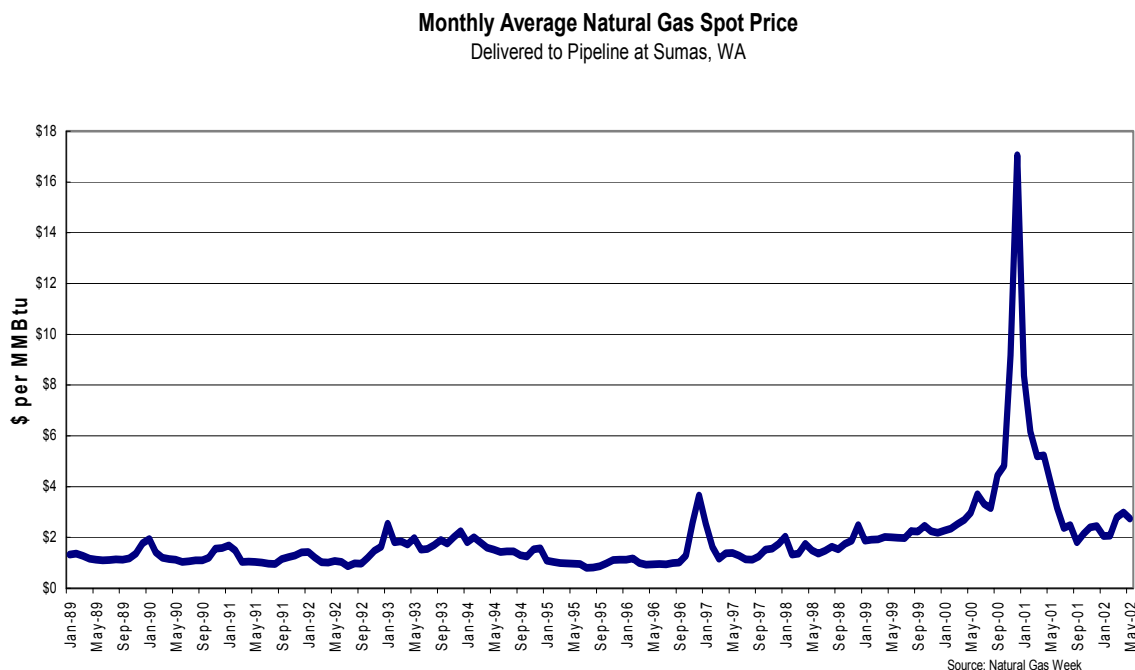
Each question is followed by a brief summary response, a description of the data (indicators) presented, and a series of figures or tables responding to the question along with an explanation for each table or figure.

1. What happened to *wholesale* energy prices in Washington?

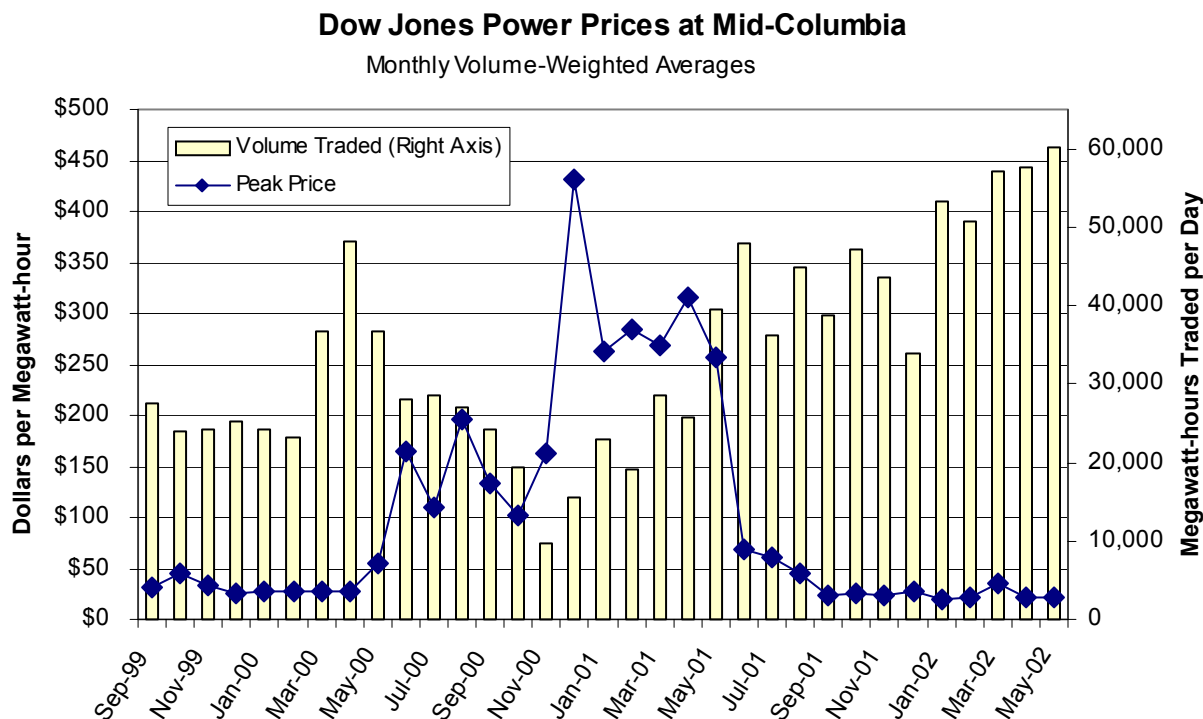
Wholesale energy prices on the spot market for electricity and natural gas increased significantly beginning in late 2000 through mid-2001. By late 2001, these prices returned to pre-crisis levels and recent spot market electricity prices have been below historical levels. Note that spot markets are only a small portion of the total energy market. Those utilities or consumers most exposed to spot market prices were most impacted by the increase in these prices.

Indicators:

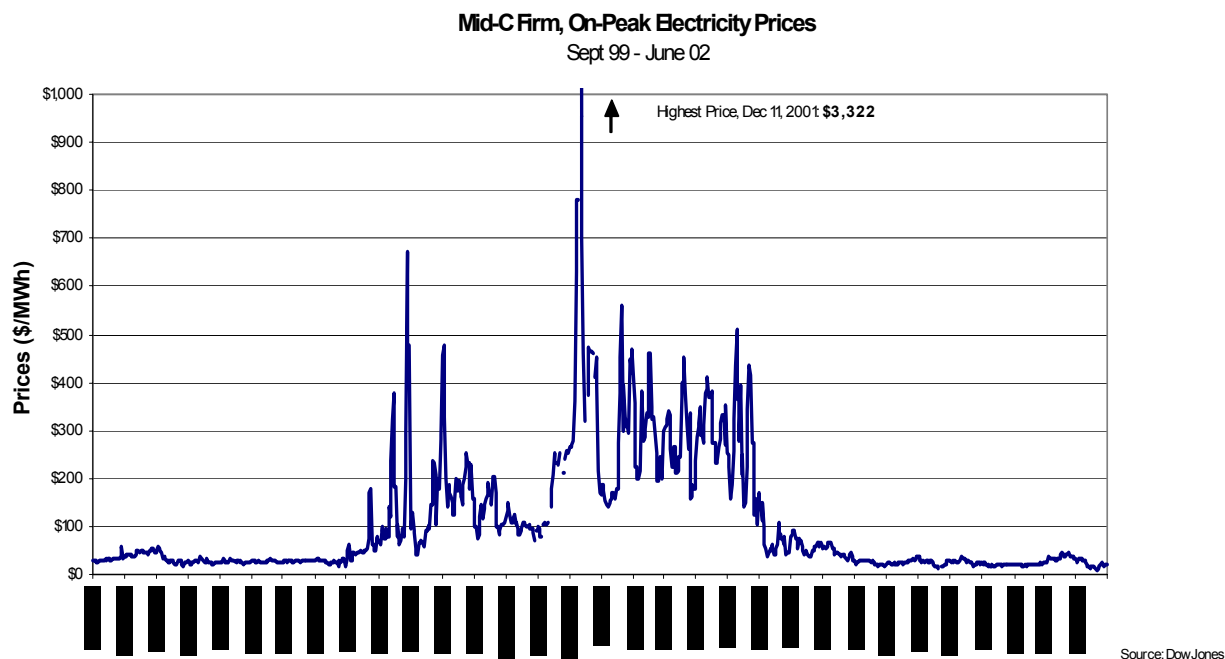
- Historical monthly average natural gas spot prices at the Sumas, Washington hub [source: Natural Gas Week]
- Wholesale monthly volume-weighted average spot market electricity prices at the mid-Columbia hub [source: Dow Jones]
- Wholesale daily peak market electricity prices at the mid-Columbia hub [source: Dow Jones]
- Washington electricity consumption compared to mid-C volumes [source: Dow Jones and EIA]



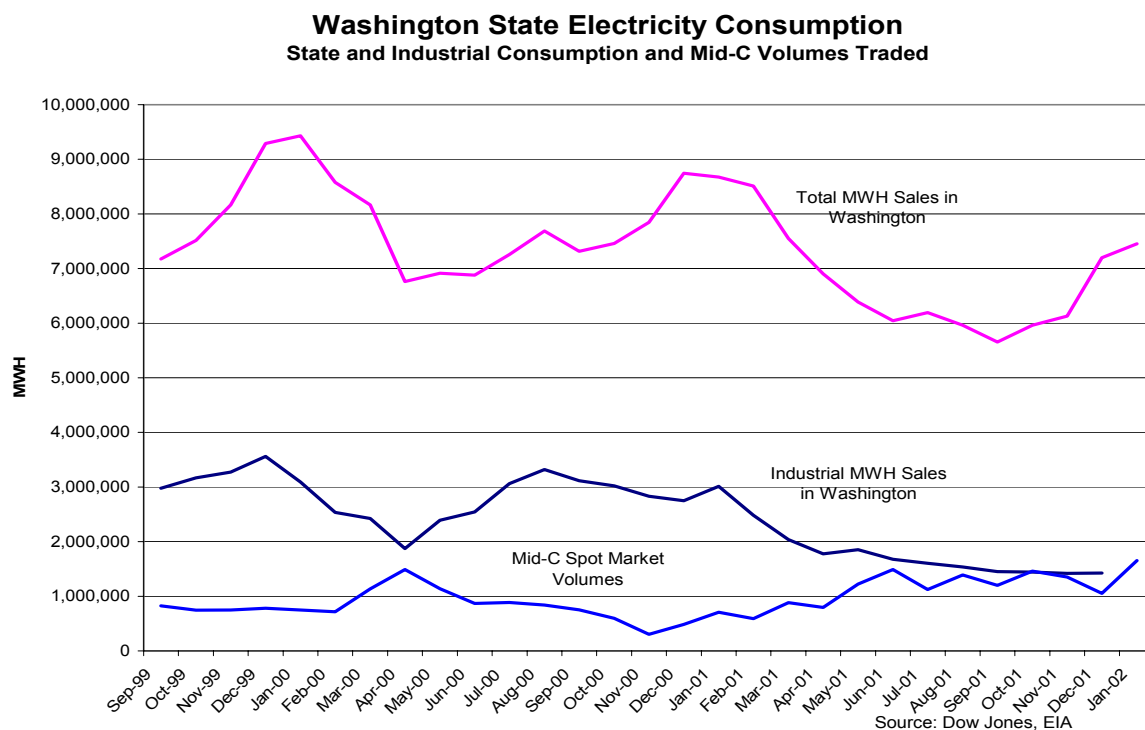
Historical spot market natural gas prices at Sumas have been less than \$2/mmBtu. Prices began to rise above this level in early 2000, peaking in December 2000. By September 2001 prices were nearing the \$2/mmBtu level.



In mid-2000 monthly (volume-weighted average) spot market electricity prices at the mid-Columbia hub began to climb, peaking in January 2001. Peak values were more than an order of magnitude higher than historical prices. Volumes of sales declined significantly during the period of high prices. By September 2001 prices had returned to historical levels and recent prices have even dropped below this level.



Daily peak spot market electricity prices at the mid-Columbia hub experienced a great deal of volatility from mid-2000 to until late summer 2001. The peak price of \$3,322/MWh on December 11, 2000 was 100 times historical average prices. But recent prices have been at or below historical averages with little volatility.



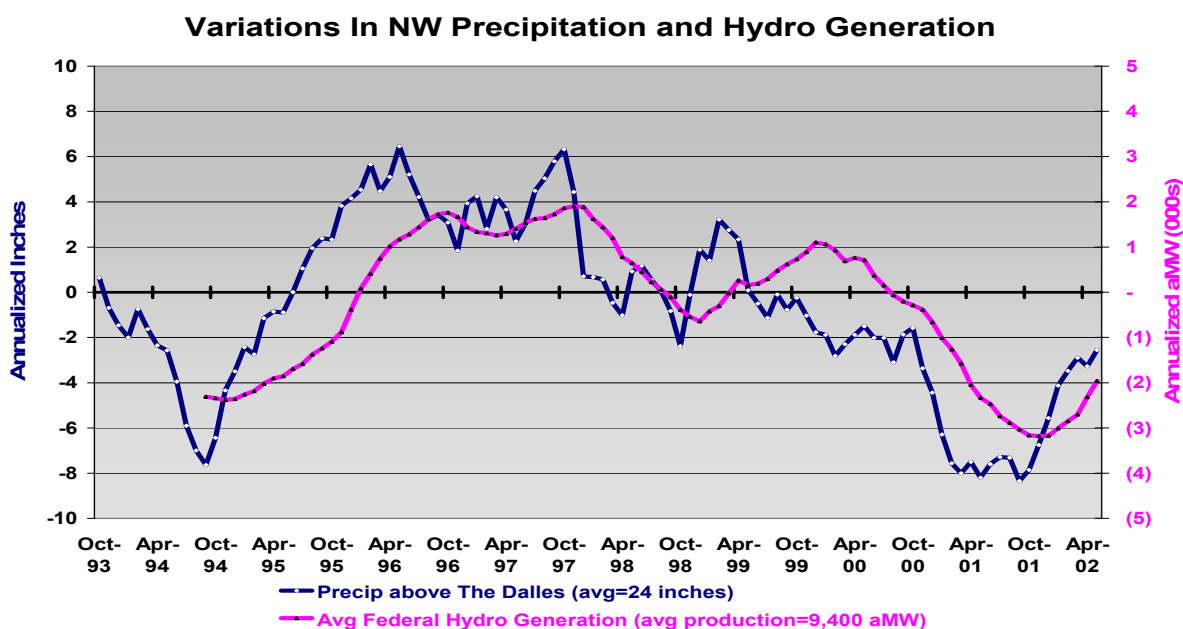
The volume of electricity sales at the mid-Columbia hub is small relative to the total electricity sales in Washington State. Only a portion of the sales made at the mid-Columbia hub are for customers in Washington State.

2. What was the impact of the drought on electricity supply?

Hydroelectric generation capacity dropped significantly due to the drought. The generation capacity of the hydroelectric system is dependent on precipitation and snow pack in the region. Generation capacity varies significantly depending on these factors. At the height of the drought, annual generation on the Federal hydro system was more than 30 percent below the historical average.

Indicator:

- Variation in Federal Columbia River Power System (RCRPS) hydroelectric production relative to precipitation above The Dalles [source: Bonneville Power Administration]



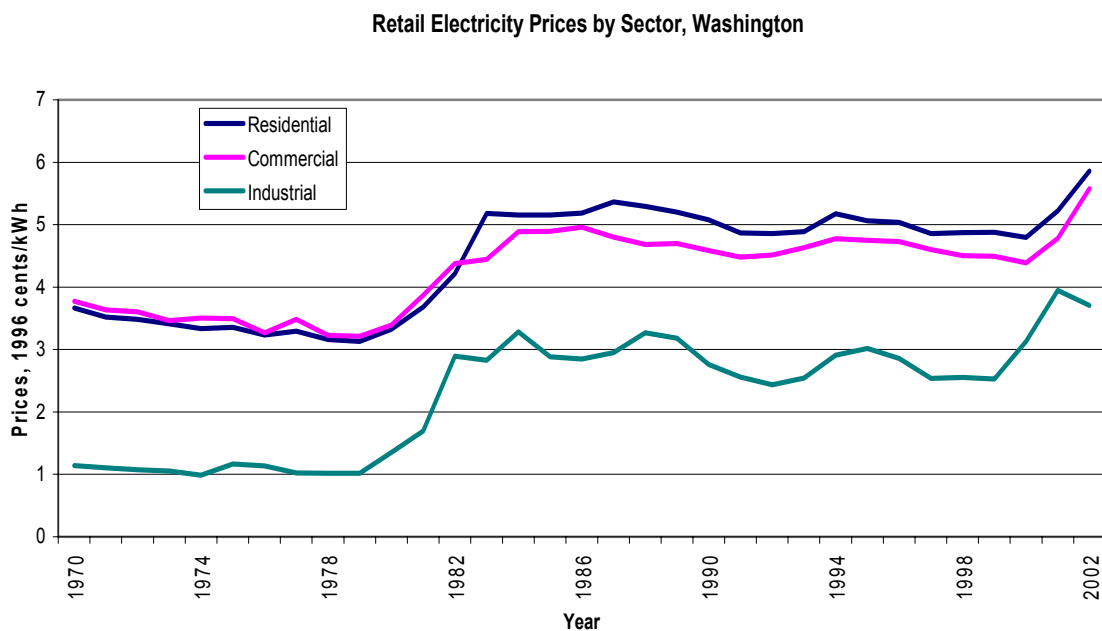
Hydro generation capacity varies significantly depending on precipitation in the region. Generation capacity on the Federal hydro system was 10 to 20 percent above normal during a relatively wet period in 1996 and 1997, but dropped 30 percent below normal by late 2001. There was almost a 30 percent drop from 2000 to 2001 in hydro generated electricity serving Washington consumers, which is equivalent to a decline in hydro generation capacity of almost 2,700 aMW.

3. How have retail natural gas and electricity prices in Washington changed as a result of the west coast energy crisis?

Retail residential and commercial electricity prices have increased approximately 20 percent since 1999 and industrial prices increased almost 50 percent. Natural gas prices for residential and commercial consumers increased about 60 percent from 1999 to 2001, while those for commercial consumers increased more than 40 percent.

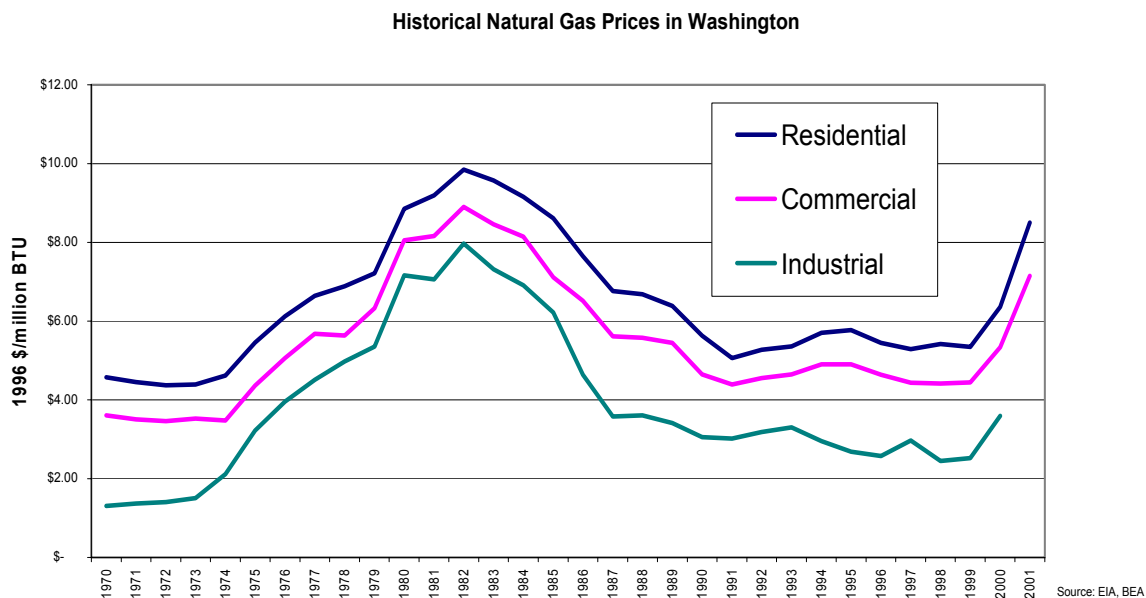
Indicator:

- Average real retail electricity price trends by sector [source: EIA and U.S. Department of Commerce Bureau of Economic Analysis]
- Average real retail natural gas price trends by sector (Natural gas prices for 2002 and 2001 (except residential) are not available.) [source: EIA and U.S. Department of Commerce Bureau of Economic Analysis]



Note: 2002 values are year-to-date through June. Values for 2001 and 2002 are estimates and may be revised.

Inflation adjusted retail electricity rates have been relatively stable in Washington since the last significant increase in prices in the late 1970's and early 1980's. But, prices began to increase for industrial consumers in 2000 and for residential and commercial consumers in 2001. Price increases were most dramatic for industrial customers rising more than 50 percent from 1999 to 2001 before dropping slightly in 2002. The increase in residential and commercial prices from 1999 to 2002 was 20 and 24 percent respectively (inflation adjusted).



After peaking in the early 1980's, inflation adjusted retail natural gas prices declined through the late 1990's. Beginning in 2000 prices began to rise due to constrained natural gas capacity and increased demand. From 1999 to 2001, residential natural gas prices increased more than 60 percent and commercial prices increased by more than 70 percent. Industrial prices climbed by more than 40 percent from 1999 to 2000 (2001 values are not currently available).

4. How do retail electricity and natural gas price increases affect Washington's "average" household and commercial business?

Estimated average monthly electricity bills have increased around 30% for residential and commercial consumers from 1999 to 2001. Estimated natural gas bills increased by over 60% for residential consumers and over 70 percent for commercial consumers from 1999 to 2001 (2002 data are not available).

Indicator:

- Average household and business electricity expenditures for 2002 and 1999 (these estimates assume the same level of consumption in 2002 and 1999 and do not account for inflation) [source: EIA]
- Average household and business natural gas expenditures for 2001 and 1999 (these estimates assume the same level of consumption in 2001 and 1999 and do not account for inflation) [source: EIA]

Electricity Expenditures		1999	2002 Estimated	Difference
Annual expenditures per residential customer	\$	700.06	\$ 889.08	\$ 189.02
Monthly expenditures per residential customer	\$	58.34	\$ 74.09	\$ 15.75
Annual expenditures per commercial customer	\$	4,593.69	\$ 6,063.67	\$ 1,469.98
Monthly expenditures per commercial customer	\$	382.81	\$ 505.31	\$ 122.50

Natural Gas Expenditures		1999	2001 Estimated	Difference
Annual expenditures per residential customer	\$	541.13	\$ 898.28	\$ 357.15
Monthly expenditures per residential customer	\$	45.09	\$ 74.86	\$ 29.76
Annual expenditures per commercial customer	\$	3,063.15	\$ 5,391.15	\$ 2,328.00
Monthly expenditures per commercial customer	\$	255.26	\$ 449.26	\$ 194.00

The average residential household saw their monthly electricity bill increase about \$16/month from 1999 to 2002 and their monthly natural gas bill increase about \$30/month from 1999 to 2001. The average commercial business saw their monthly electricity bill increase a little more than \$120/month and their natural gas bill increased a little more than \$190/month.

Note. These values represent **statewide averages** and do not reflect the wide range of retail electricity price increases for the state's utilities ranging for less than 5% to more than 50%. In addition, retail natural gas rates have declined significantly in 2002.

5. As a result of the West Coast energy crisis, how do energy prices in Washington compare to other states?

Washington's relative advantage as a low cost electricity state has been declining. In 1999 Washington had the lowest electricity prices for residential and industrial consumers and the next to lowest commercial prices. By 2002, approximately 40 percent of the states had lower commercial and industrial electricity prices and 15 percent had lower residential prices. Washington's relative ranking for natural gas prices changed from slightly lower prices than average for the commercial and residential sectors to prices that were similar to the U.S. average. Washington industrial natural gas prices were among the lowest in 1999. A few more states had lower prices in 2000 and data are not yet available for 2001.

Indicator:

- Washington's ranking for retail electricity prices by sector relative to other states. [source: EIA]
- Washington's ranking for retail natural gas prices by sector relative to other states (prices are not available (na) for 2002 and for the industrial sector in 2001) [source: EIA]

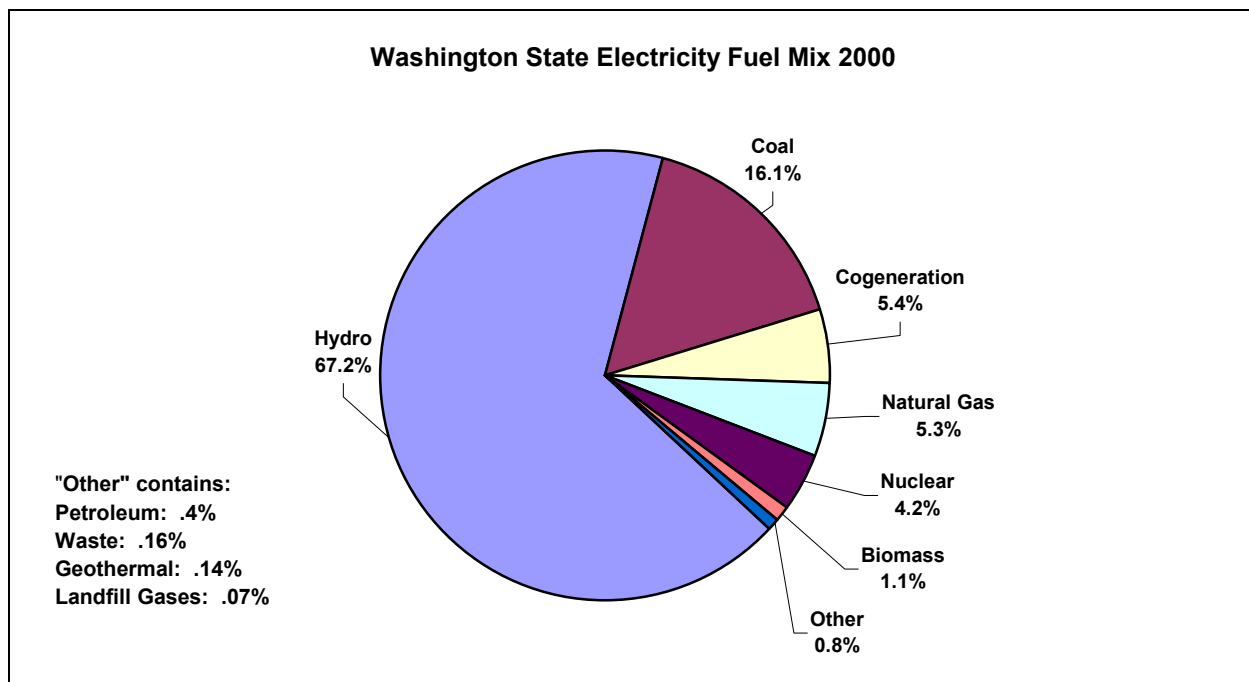
(50=lowest; Washington State Ranking 1=highest) red = estimate				
Electricity Prices				
	YTD 2002	2001	2000	1999
Residential	44	49	50	50
Commercial	32	47	49	49
Industrial	33	34	45	50
Natural Gas Prices				
	YTD 2002	2001	2000	1999
Residential	na	26	37	35
Commercial	na	23	34	33
Industrial	na	na	42	46

6. How does new generation influence the diversity of generation in the state?

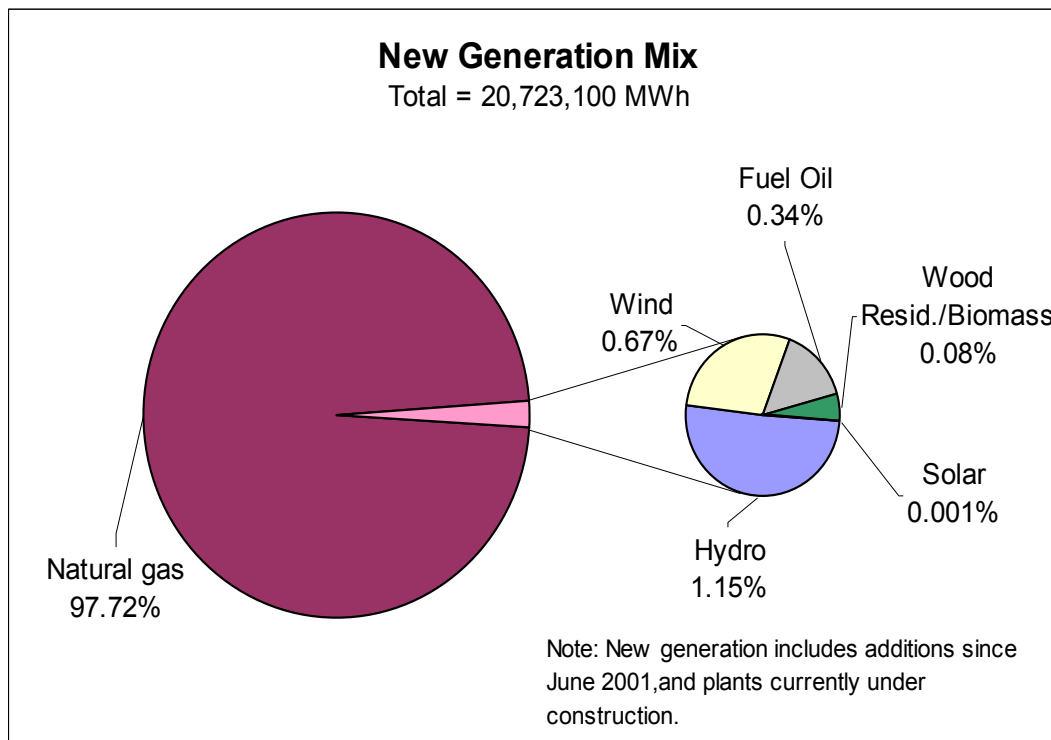
Washington's current electricity generation mix is dominated by hydroelectric production, but new generation is predominately fueled by natural gas. Thus the future generation mix will have a higher proportion of natural gas fueled generation and the hydroelectric share will decline, although it will still account for more than 60 percent of in-state electricity production.

Indicator:

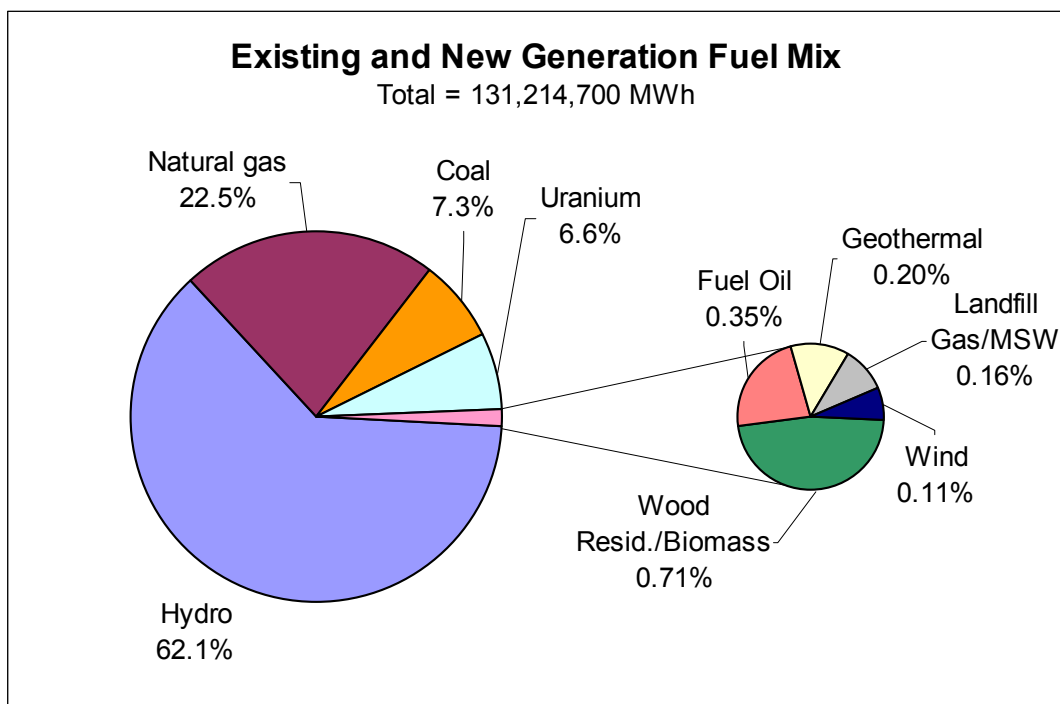
- Washington's existing electricity generation capacity by type of fuel based on actual generation in 2000, which was a relatively typical year [source: Washington's fuel mix disclosure database]
- Washington's new electricity generation capacity by type of fuel based on additions since June 2001 and plants currently under construction using estimated capacity factors [source: Northwest Power Planning Council]
- Washington's projected electricity generation capacity by type of fuel based on a combination of the existing capacity and new capacity [source: Washington's fuel mix disclosure database and Northwest Power Planning Council]



Almost three-quarters of the electricity generated in Washington State in 2000 (a relatively typical year) was produced by hydroelectric power plants. Natural gas, coal-fired, and nuclear (uranium) power plants each account for about 8 percent of electricity generation. A mix of fuel types make up the remaining one and a half percent of electricity generation in Washington.



Natural gas fired power plants account for almost all of the new generation capacity being added in Washington State. The remaining several percent of new generation is mostly a mix of hydro, wind, and diesel generators. Note that the actual electricity generation of these new power plants will vary depending on electricity demand and energy market conditions.



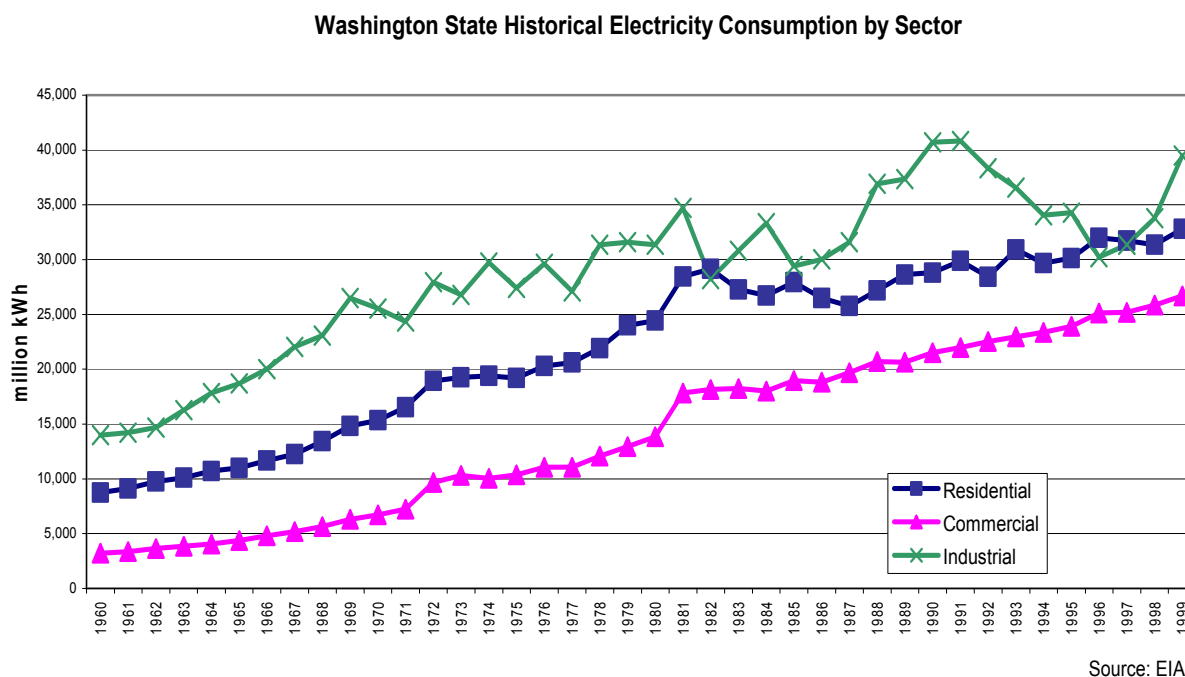
This figure illustrates a hypothetical future electricity generation mix for Washington State by combining the existing generation mix with the new generation being added. In this illustration, the share for natural gas-fired generation increases to almost a quarter of the generation mix, while the shares for hydro, coal, and uranium decline. Hydro still accounts for over half the generation capacity. Note that the actual future generation mix will depend on electricity demand, energy market conditions, and stream flows for hydro generation. Some existing capacity may be displaced by new generation capacity.

7. Where is growth occurring in electricity consumption in the state?

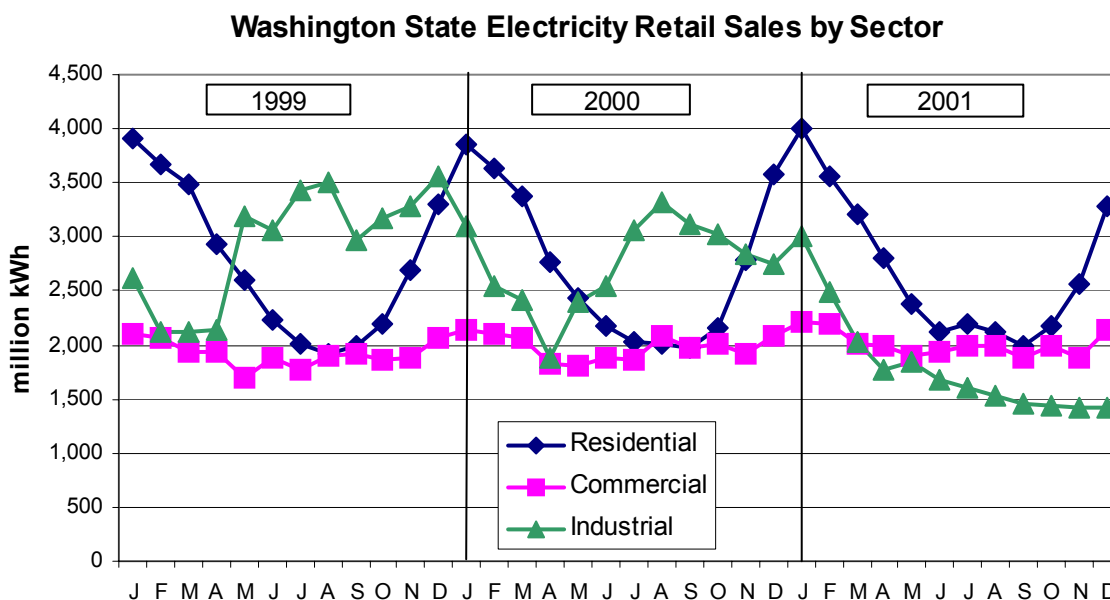
Historically electricity use in Washington State has been growing, but recently industrial use has declined while residential and commercial use has remained relatively constant.

Indicator:

- Historical annual electricity consumption in Washington State by sector [source: EIA]
- Recent monthly electricity consumption in Washington State by sector [source: EIA]



Electricity consumption in Washington has grown steadily over the last several decades and by 1999 was almost four times greater than in 1960. The industrial sector accounts for the largest share of consumption over the period from 1960 to 1999, but over the last decade consumption in the sector has varied by almost 25 percent.



Monthly residential and commercial electricity consumption over the last several years shows similar patterns and levels of use. Residential monthly electricity consumption peaks in the winter months reflecting increased use for space heating, while commercial use is relatively steady throughout the year. Industrial electricity use tails off significantly in 2001, likely due to the shutdown of aluminum smelters in the state. As a result, annual electricity consumption in 2001 for both the residential and commercial sectors exceeds industrial use for the first time.

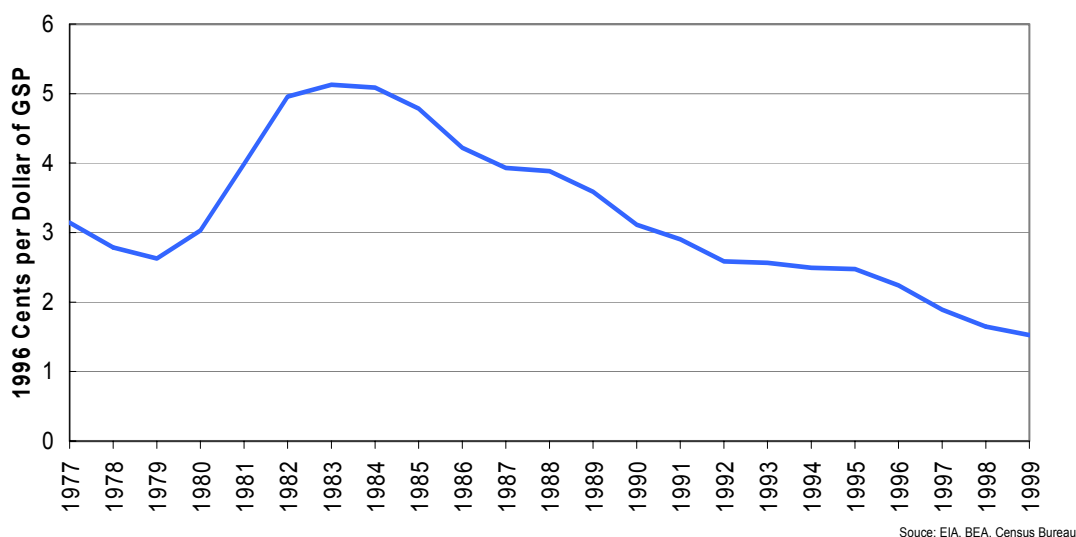
8. How does growth in electricity consumption and expenditures relate to other economic indicators?

Historically, electricity expenditures and consumption have been declining relative to gross state product and employment.

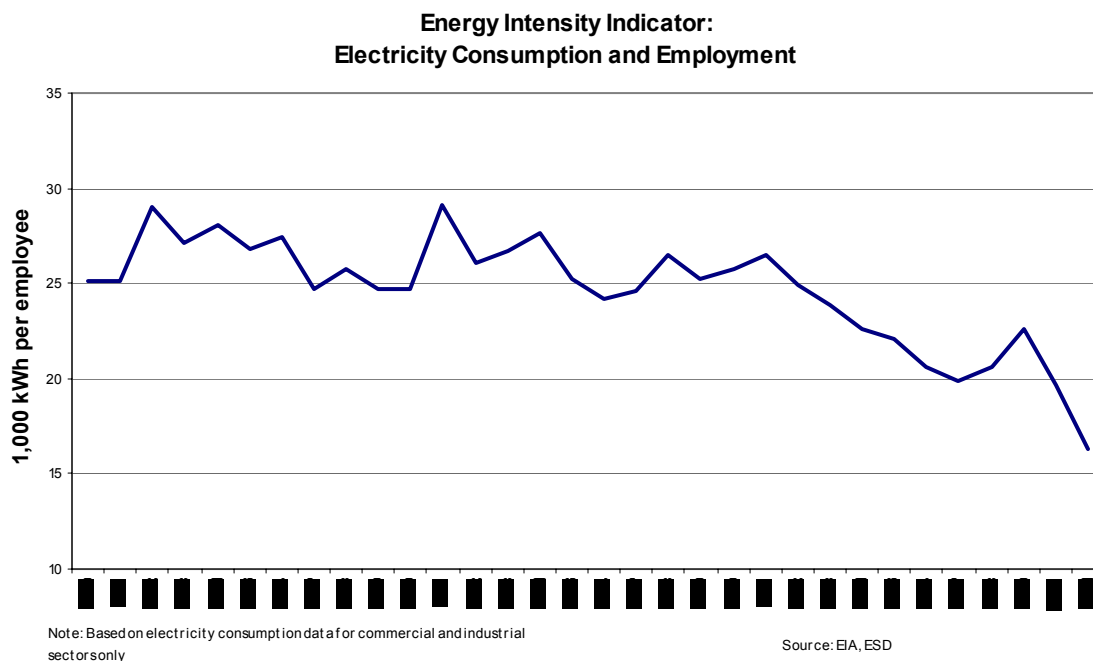
Indicator:

- Historical Washington State electricity expenditures per gross state product [source: EIA, U.S Department of Commerce Bureau of Economic Analysis, and U.S Census Bureau]
- Historical Washington State commercial and industrial electricity use per employee [source: EIA, Washington State Department of Employment Security]

Electricity Expenditures per Dollar of WA Gross State Product



Electricity expenditures per dollar of Washington State gross state product declined steadily from the peak in 1983 through 1999. This was due in part to relatively stable electricity prices during this period while the economy continued to grow. It also may reflect shifts in the economy to less energy intensive industries and services.



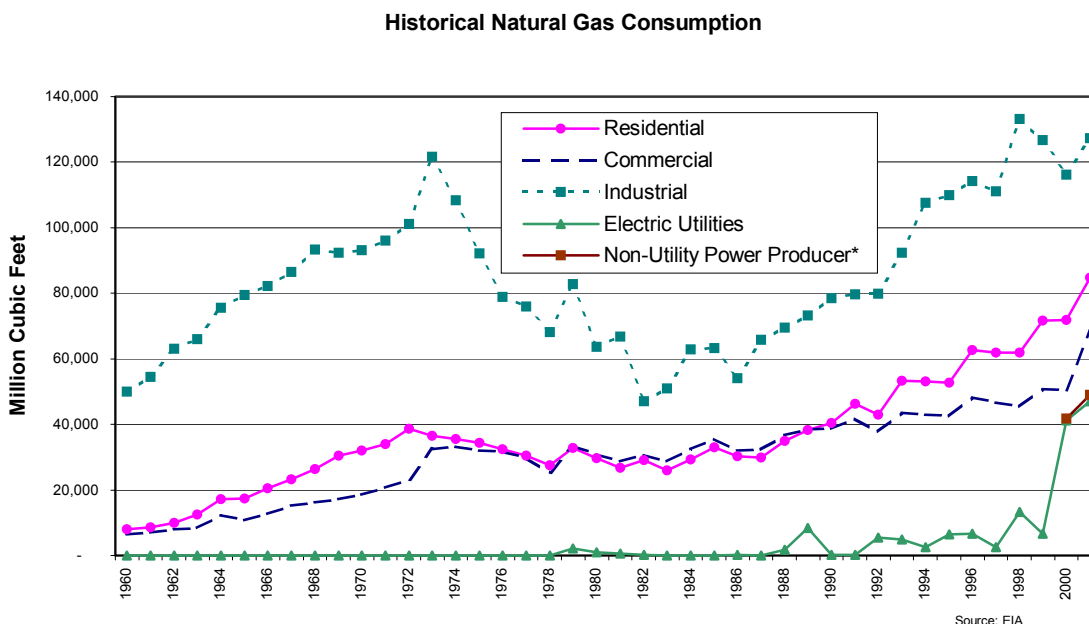
Electricity consumption in the commercial and industrial sectors relative to state employment has declined fairly significantly in the last ten years. This likely reflects a shift to less energy intensive industries.

9. Where is growth occurring in natural gas consumption in the state? Is there any evidence of increasing consumption for electricity generation?

Total natural gas consumption in Washington State has tripled since the early 1980's. In the last several years, an increase in the use of natural gas for electricity generation has contributed to this increase.

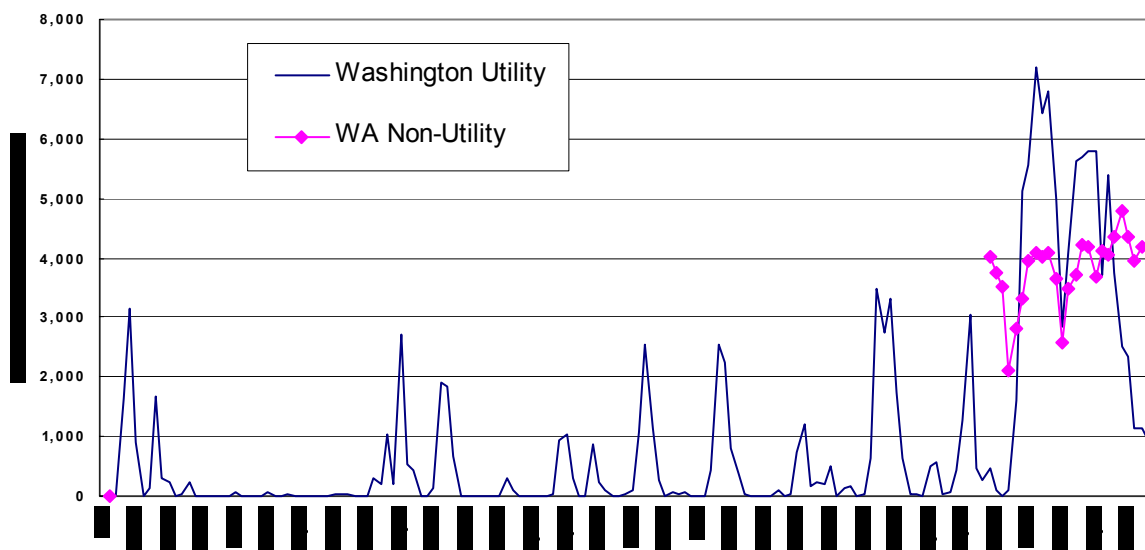
Indicator:

- Historical Washington State natural gas consumption by sector including use for electricity generation [source: EIA]
- Historical natural gas deliveries to electric power generators in Washington [source: EIA]



*Note: Data for non-utility generators is only available for 2000 and 2001.

Natural gas consumption in Washington State has grown significantly since the early 1980's and is now more than three times greater than the value in 1982 and 1983. Currently industrial consumption accounts for about a third of total use while electricity generation accounts for almost a quarter of use. Residential and commercial use account for a little more than 20 percent of total use each.

Natural Gas Deliveries to Electric Power Generators in Washington

*Note: Data for non-utility generators is only available for 2000 and 2001.

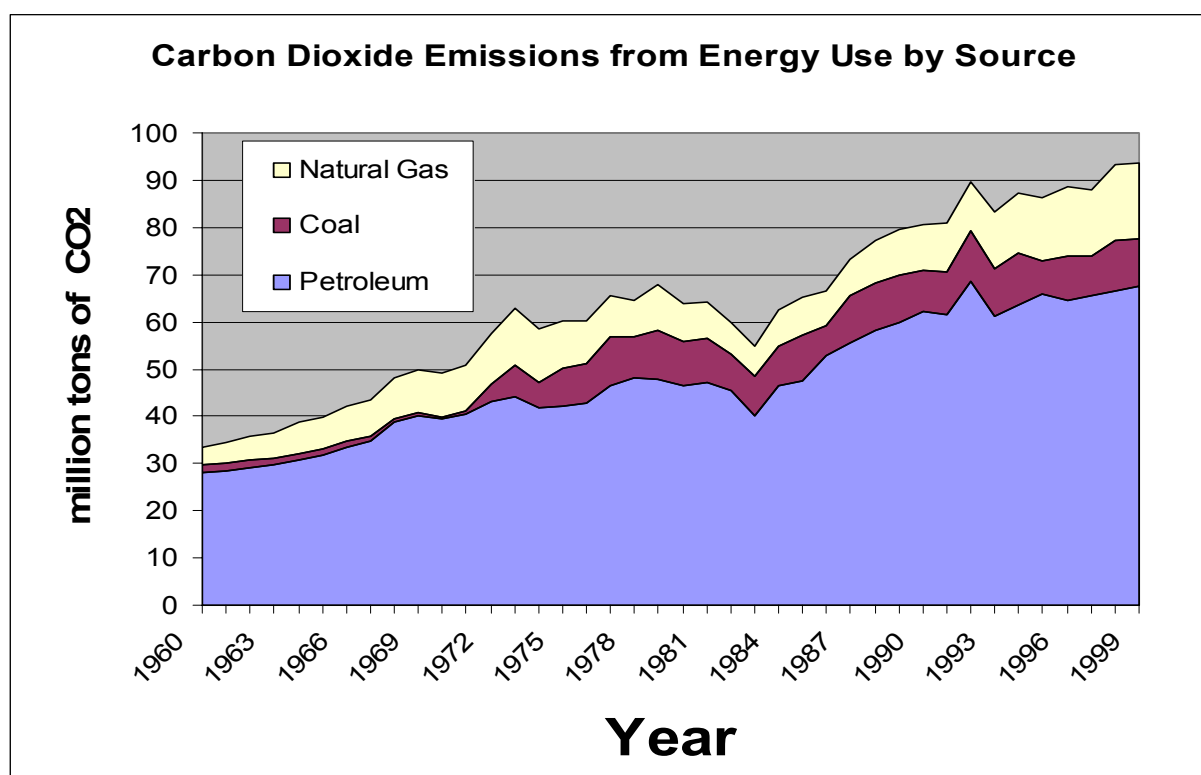
Historically, electric utilities have used natural gas-fired power plants largely for use during periods of peak demand or when adequate supplies were not available from other sources. Over the last several years the use of natural gas for electricity generation has grown. Data for natural gas use by non-utility generators is not available prior to 2000, although generation from these sources has mostly occurred in recent years.

10. What is the impact of energy consumption in Washington on the production of greenhouse gases?

The production of greenhouse gas from energy use has grown significantly over the last 40 years. Emissions from the consumption of petroleum products (primarily for transportation) are the major contributor to greenhouse gases in Washington.

Indicator:

- Carbon Dioxide emissions (the key greenhouse gas) from the consumption of energy in Washington State [source: EIA]



Carbon dioxide emissions from energy use have almost tripled in the last 40 years. This reflects increased consumption of fossil fuels in Washington State. Emissions from the consumption of petroleum (primarily for transportation) account for over two-thirds of total emissions.

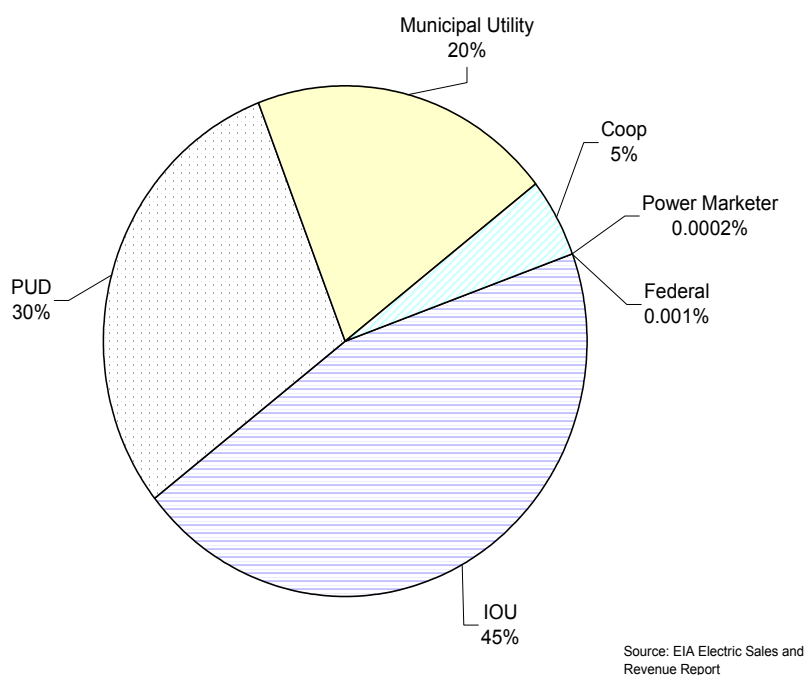
11. What is the mix of utility types in Washington?

Publicly-owned utilities account for more than half of Washington State's customers and electricity sales to end-users.

Indicator:

- Washington State utility customers in 2000 by type of ownership [source: EIA]
- Washington State utility electricity sales to end-users in 2000 by type of ownership [source: EIA]

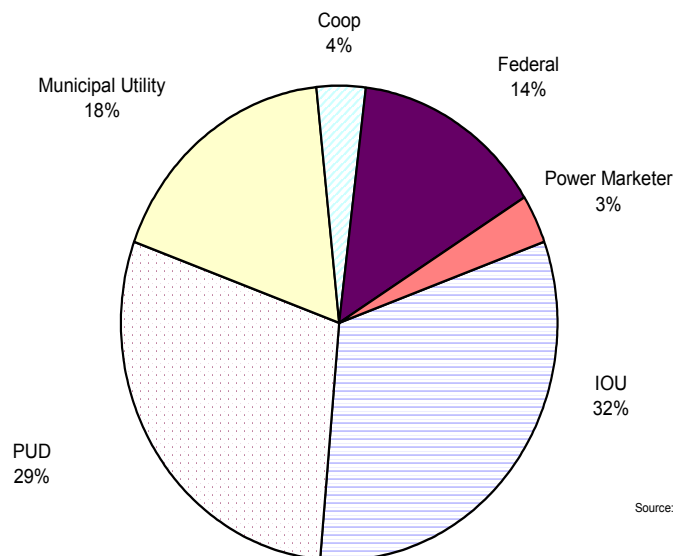
Washington State Electric Utility Customer Share in 2000 by Class of Ownership
Total number of Customers = 2,752,288



Investor owned utilities serve a little less than half of the electric utility customers in Washington. Public utilities (PUD, municipal utilities, and cooperatives) account for the most of the remaining customers. The small fraction attributed to 'Federal' reflects the small number of large industries directly served by the Bonneville Power Administration.

Washington State Electricity Sales and Average Price in 2000 by Class of Ownership

Total MWh Sales = 96,511,121



Source: EIA Electric Sales and Revenue Report

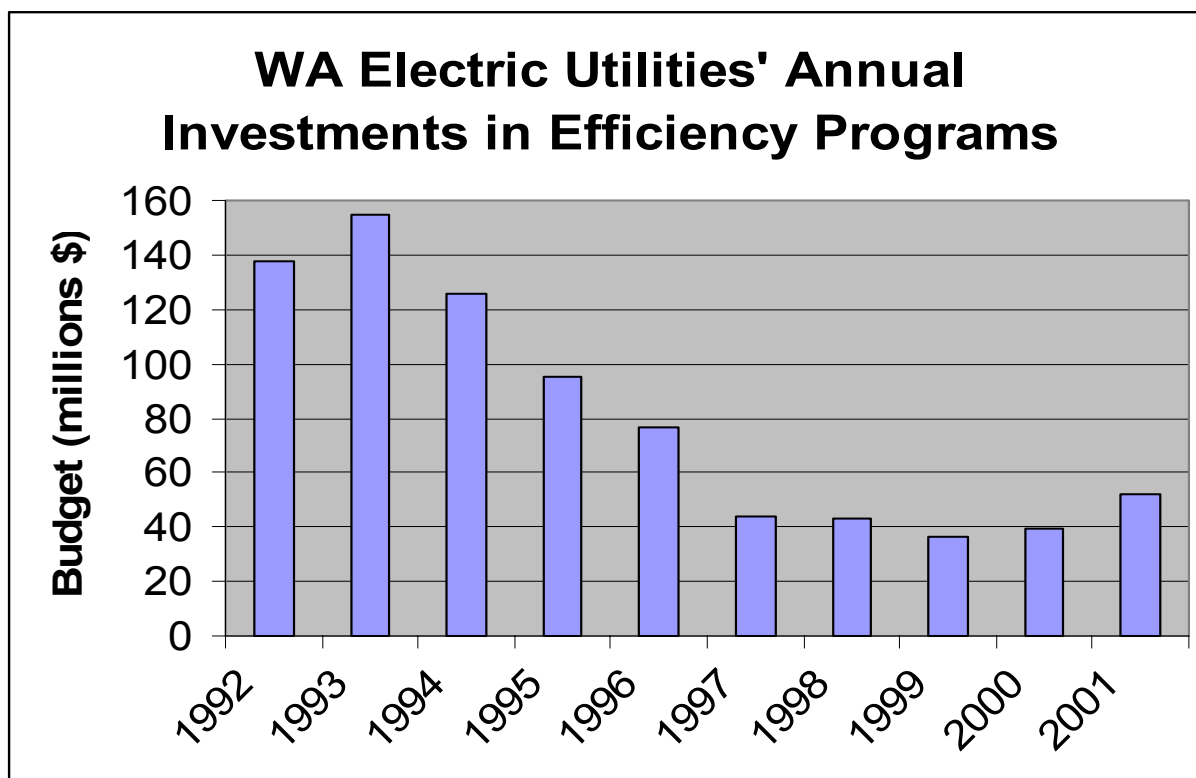
In terms of electricity sales to end-use customers in 2000, public utilities accounted for a little more than half of the sales. Investor owned utilities accounted for about a third of sales. Even though the Bonneville Power serves much less than one percent of the end-use customers, the large volume of consumption for these customers adds up to almost 14 percent of sales.

12. What is the level of investment in energy conservation in Washington?

The level of conservation investment in Washington has declined since the early 1990's, but is beginning to rise again.

Indicator:

- Historical investment by Washington utilities in energy efficiency programs [source: Northwest Power Planning Council]



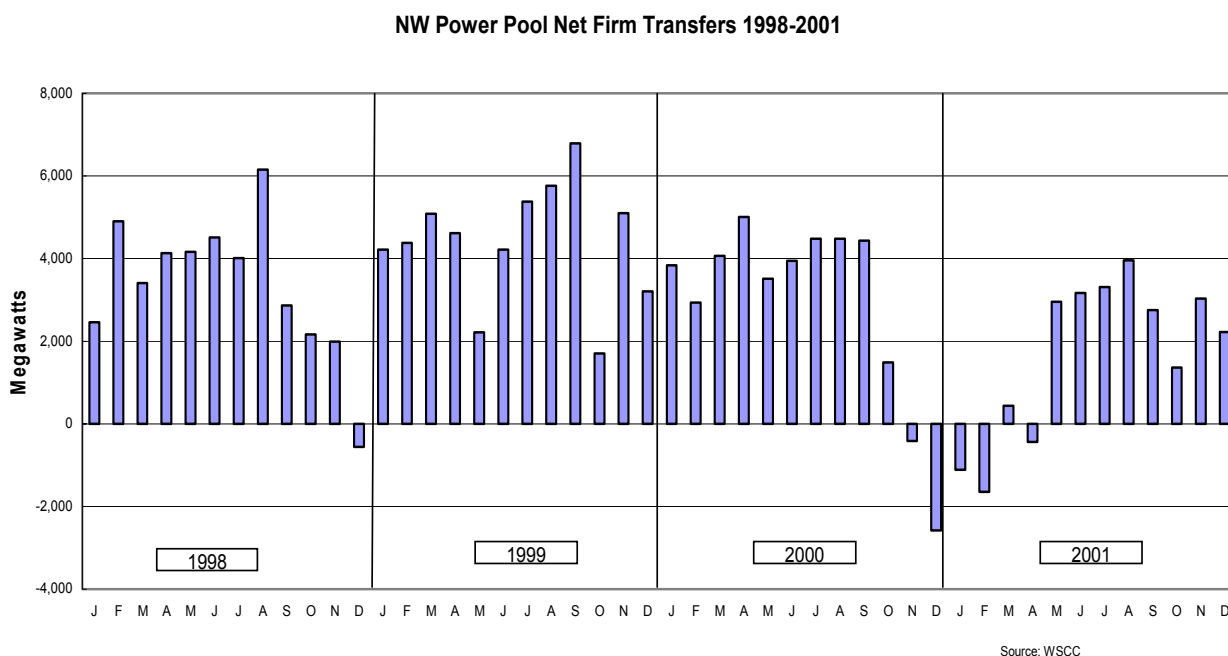
Investment by Washington State utilities in energy efficiency programs peaked in 1993. By 1999 the level of investment had declined by more than 70 percent. This trend reversed in 2000 and 2001 with modest increases in investment.

13. What is the electricity flow into and out of the region?

The Northwest Power Pool is a net exporter of power during much of the year, although this changed in early 2001.

Indicator:

- Net firm transfers of power from 1998 to 2001 for the U.S. portion of the Northwest Power Pool [source: Northwest Power Pool]



Over the last several years, the U.S portion of the Northwest Power Pool has been a net exporter of power (positive values in the figure). In 2000, the magnitude of exports began to decline and the region imported power during the winter of 2001. Exports during the remainder of 2001 were somewhat less than previous years.